



Preserving Groundwater Recharge

*Managing Stormwater
as a Valuable Resource*



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Why care about stormwater?

✧ It's a local flooding **nuisance**

◆ Solution: Get rid of it (curbs & gutters)!

✧ It carries sediment and contributes to drainage basin **flooding**

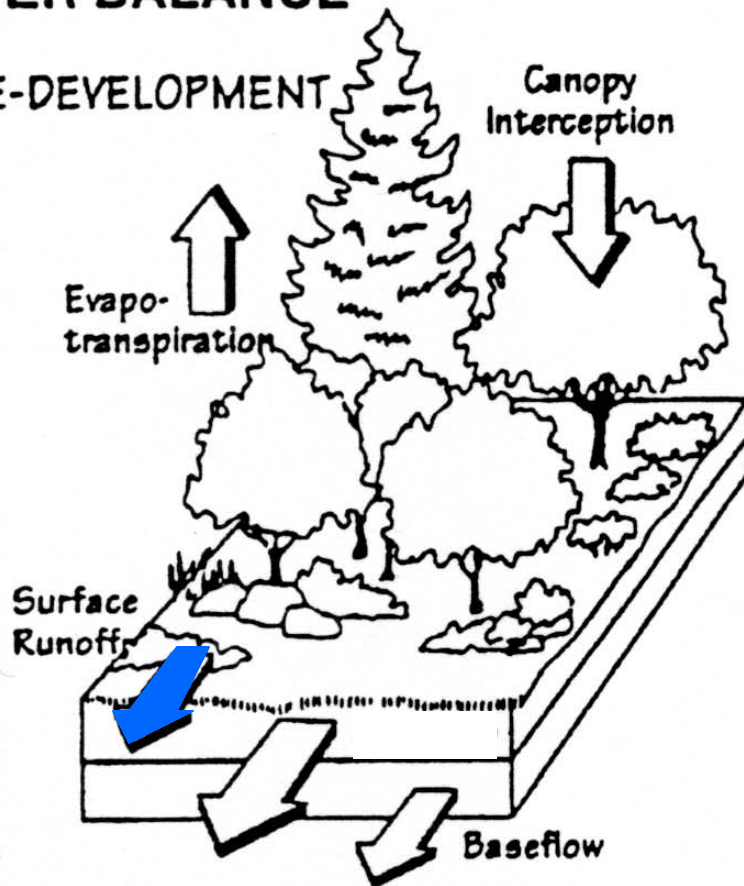
◆ Solution: Treatment, detention, slow release

✧ It should be **recharging groundwater**

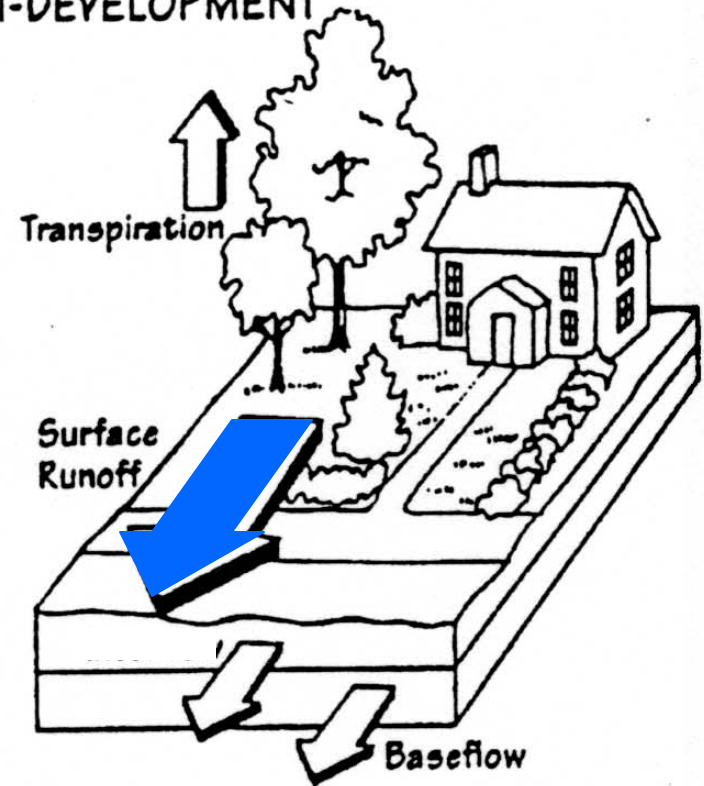
◆ Solution: Retention and infiltration

WATER BALANCE

PRE-DEVELOPMENT



POST-DEVELOPMENT



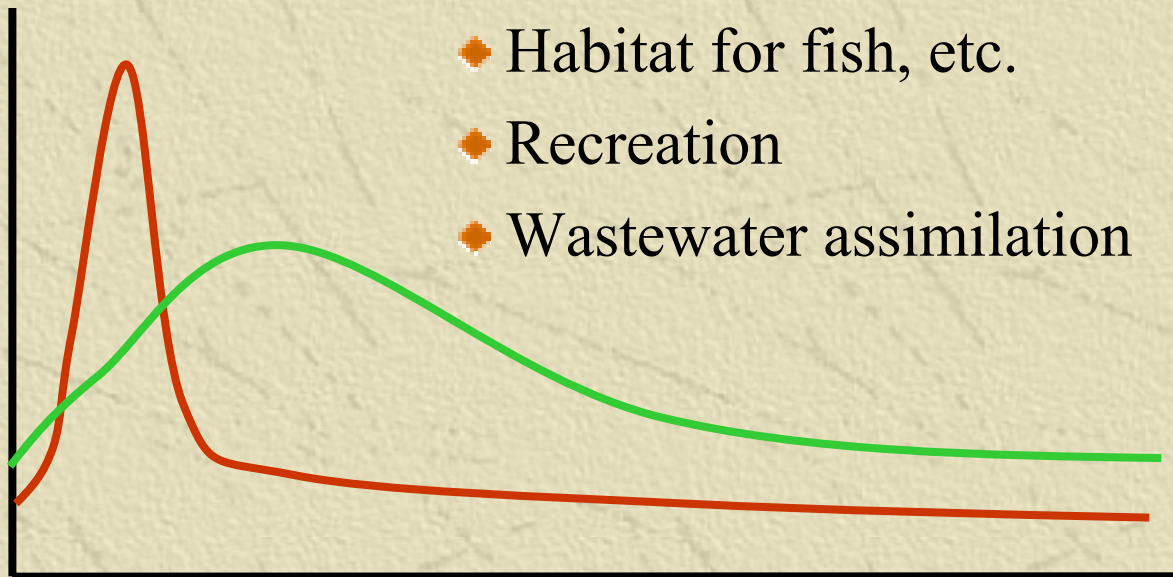
Importance of Recharge

✧ Replenishes Groundwater

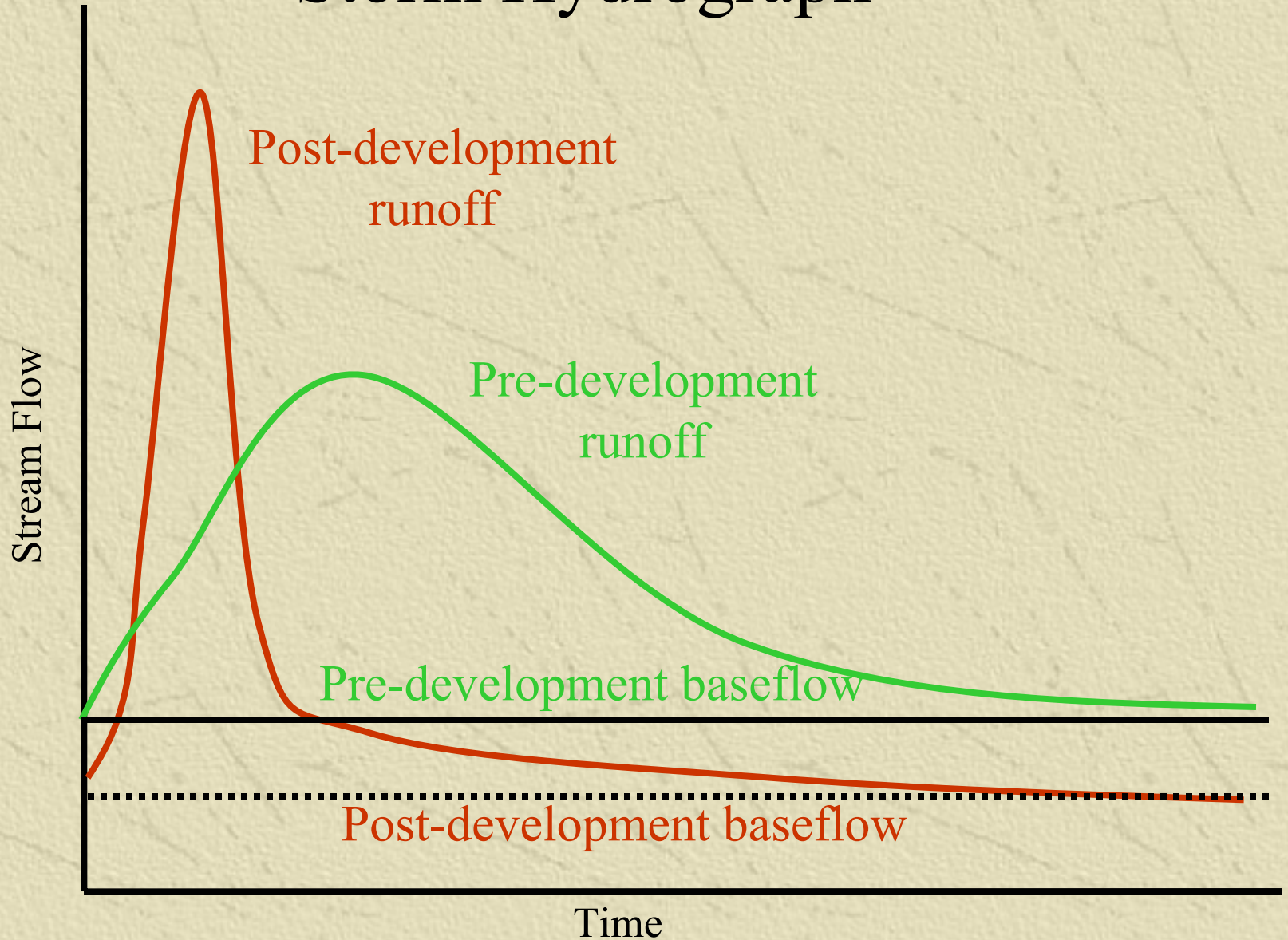
- ✧ Water supply
- ✧ Industrial, agricultural withdrawals

✧ Supplies Baseflow

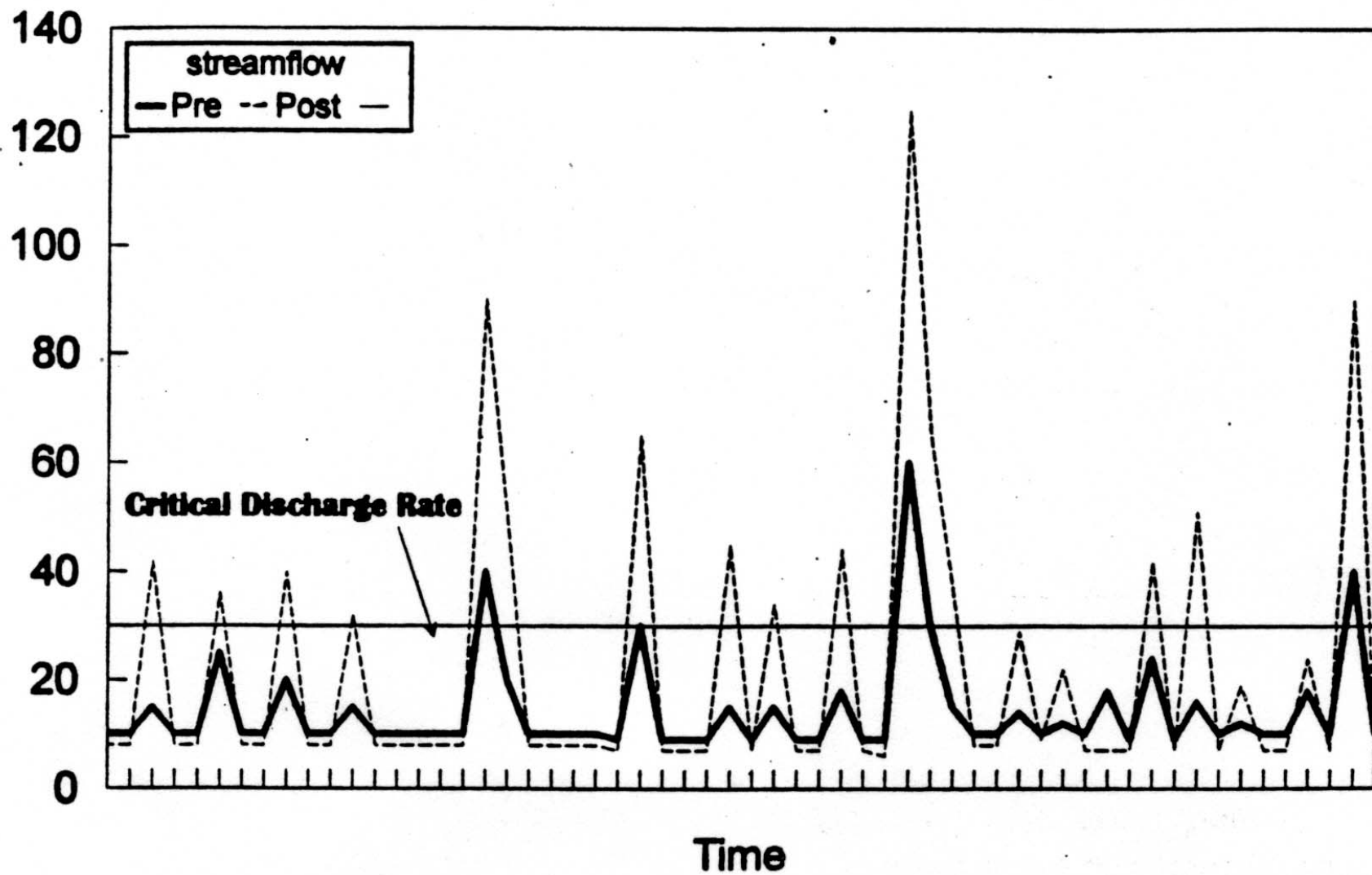
- ✧ Habitat for fish, etc.
- ✧ Recreation
- ✧ Wastewater assimilation

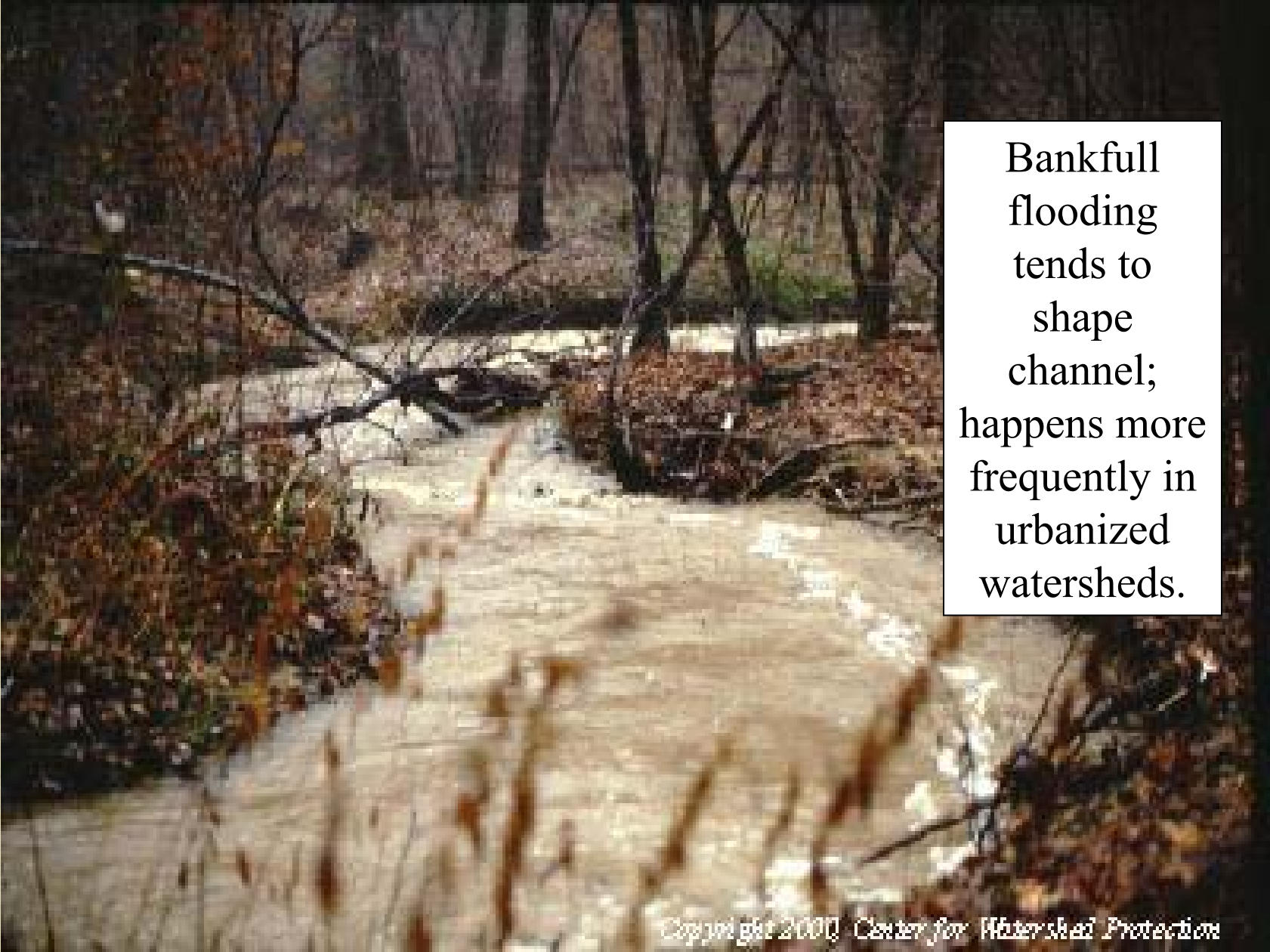


Storm Hydrograph



stream flow (cfs)





Bankfull
flooding
tends to
shape
channel;
happens more
frequently in
urbanized
watersheds.

Copyright 2000 Center for Watershed Protection

Stream With 10% Impervious Cover

-
- ✦ Visibly impacted
 - ✦ Channel size doubled
 - ✦ Tree roots exposed
 - ✦ Pool and riffle structure lost



Impervious Cover/Stormwater Impacts on Stream Habitat

- ✧ Water quality
- ✧ Wetted perimeter, baseflow volume
- ✧ Temperatures increase
- ✧ Less large woody debris
- ✧ Loss of shade along banks
- ✧ Results: loss of diversity

Stormwater a Growing Problem

✦ NH fastest growing state in Northeast

- ✦ 264,000 (29%) more people 1990-98
- ✦ 55% more housing units
- ✦ Another 342,800 by 2020

✦ Sprawl

- ✦ 20,000 acres of forest, farmland, and open space lost each year
- ✦ Stormwater impacts?

Stormwater BMPs - examples

✦ Detention/treatment

- ✦ **Detention ponds**
- ✦ **Constructed wetlands**

✦ Natural Infiltration

- ✦ **Grassed swales**
- ✦ **Buffer strips**
- ✦ **Filter strips**

✦ Artificial Infiltration

- ✦ **Trenches**
- ✦ **Ponds**
- ✦ **Galleries**



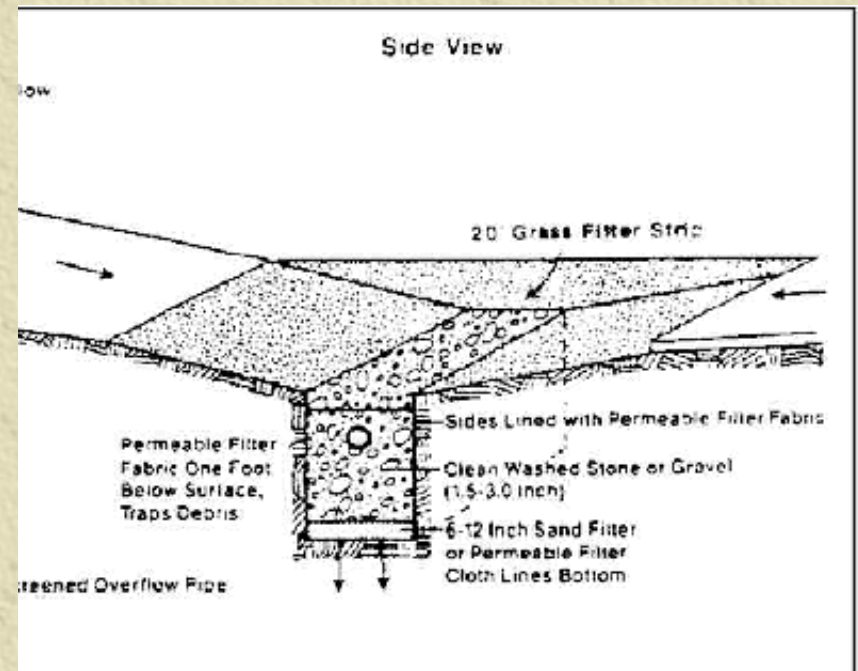
Photo: Ohio Dept of Natural Resources

**Porous design minimizes
impervious area**

Artificial Infiltration BMPs



Photo: Texas Chapter, APWA



Infiltration Trench

A photograph of a roadside landscape. In the foreground, a long, narrow, rectangular swale is filled with smooth, light-colored cobblestones. The swale is flanked by green grass. In the background, a road intersection with traffic lights is visible. To the right, there is a building with a sign that says "AutoZone" and "The Best Parts to Auto Parts". A red car is parked in front of the building. The sky is overcast.

Grassy Swale w/
Cobble Stone Bottom

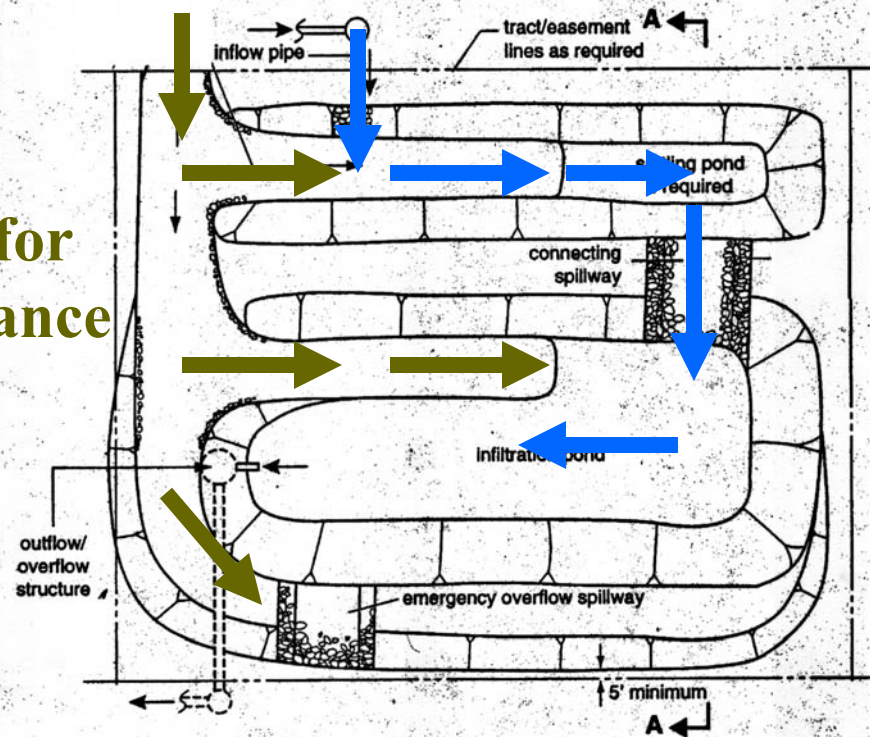
Auto Zone
Pittsburg, CA
RHL Design Group, Inc.
Project Planners - Chris Bekaris, Ken Sardo



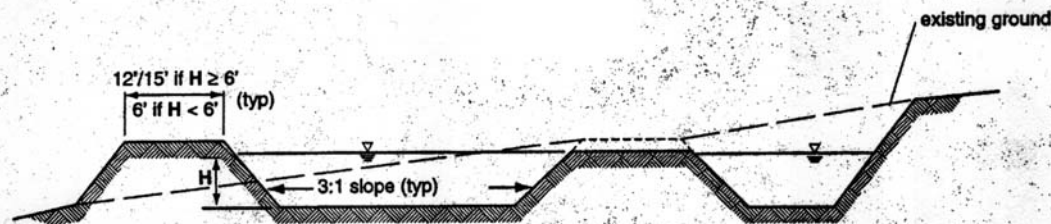
NH
Dept. of
Environmental
Services

Artificial Infiltration BMPs

Access for
Maintenance



PLAN VIEW
overflow/emergency overflow



SECTION A-A
NTS

NOTE:
Detail is a schematic representation only. Actual configuration will vary depending on specific site constraints and applicable design criteria.

Artificial Infiltration BMPs

Why they can fail

✧ Siting

- Inadequate percolation rates
- High water table
- High sediment loads

✧ Design

- Inadequate modifications for cold climates
- Inadequate pre-treatment

✧ Construction and site stabilization

✧ Post-construction clean-up

✧ Maintenance

Guidance Document

- ✧ Why groundwater recharge is important
- ✧ Call to action: stormwater infiltration
- ✧ Need for local programs
- ✧ Elements of local programs
- ✧ Examples
- ✧ Low-Impact Development appendix

Elements of Local Programs to enable Artificial Infiltration

<i>Local</i> Program Elements Needed	Small Projects	DES- Permitted Projects
Siting	X	
Design	X	
Monitoring, Maintenance	X	X
Financial Assurance	X	X

How to Preserve Groundwater Recharge

- ✧ Minimize impervious area through design
- ✧ Maximize opportunities for infiltration
 - ◆ Low impact development principles
 - ◆ Natural treatment and infiltration
 - ◆ Artificial treatment and infiltration*

**where local programs can ensure that they will continue to function as intended*